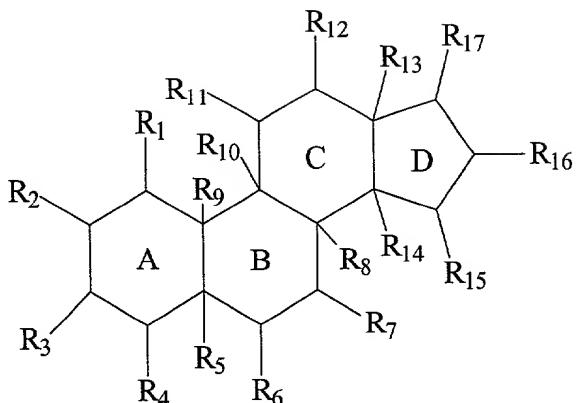


What is claimed is:

1. A compound according to formula I

2



I

3

4 wherein:

5 fused rings A, B, C, and D are independently saturated or fully or partially
6 unsaturated; and

7 R_1 through R_4 , R_6 , R_7 , R_{11} , R_{12} , R_{15} , R_{16} , and R_{17} is each independently selected from
8 the group consisting of hydrogen, hydroxyl, a substituted or unsubstituted (C1-C10) alkyl,
9 (C1-C10) hydroxyalkyl, (C1-C10) alkyloxy-(C1-C10) alkyl, (C1-C10) alkylcarboxy-(C1-
10 C10) alkyl, (C1-C10) alkylamino-(C1-C10) alkyl, (C1-C10) alkylamino- (C1-C10)
11 alkylamino, (C1-C10) alkylamino- (C1-C10) alkylamino- (C1-C10) alkylamino, a substituted
12 or unsubstituted (C1-C10) aminoalkyl, a substituted or unsubstituted aryl, a substituted or
13 unsubstituted arylamino- (C1-C10) alkyl, (C1-C10) haloalkyl, C2-C6 alkenyl, C2-C6
14 alkynyl, oxo, a linking group attached to a second steroid, a substituted or unsubstituted (C1-
15 C10) aminoalkyloxy, a substituted or unsubstituted (C1-C10) aminoalkyloxy-(C1-C10)
16 alkyl, a substituted or unsubstituted (C1-C10) aminoalkylcarboxy, a substituted or
17 unsubstituted (C1-C10) aminoalkylaminocarbonyl, a substituted or unsubstituted (C1-C10)
18 aminoalkylcarboxamido, H2N-HC(Q5)-C(O)-O-, H2N-HC(Q5)-C(O)-N(H)-, (C1-C10)
19 azidoalkyloxy, (C1-C10) cyanoalkyloxy, P.G.-HN-HC(Q5)-C(O)-O-, (C1-C10)
20 guanidinoalkyl oxy, (C1-C10) quaternaryammoniumalkylcarboxy, and (C1-C10)
21 guanidinoalkyl carboxy, where Q5 is a side chain of any amino acid, P.G. is an amino
22 protecting group, and

23 R_5 , R_8 , R_9 , R_{10} , R_{13} , and R_{14} is each independently:

24 deleted when one of fused rings A, B, C, or D is unsaturated so as to complete the
25 valency of the carbon atom at that site, or

26 selected from the group consisting of hydrogen, hydroxyl, a substituted or
27 unsubstituted (C1-C10) alkyl, (C1-C10) hydroxyalkyl, (C1-C10) alkyloxy-(C1-C10) alkyl, a

28 substituted or unsubstituted (C1-C10) aminoalkyl, a substituted or unsubstituted aryl, C1-C10
29 haloalkyl, C2-C6 alkenyl, C2-C6 alkynyl, a linking group attached to a second steroid, a
30 substituted or unsubstituted (C1-C10) aminoalkyloxy, a substituted or unsubstituted (C1-
31 C10) aminoalkylcarboxy, a substituted or unsubstituted (C1-C10) aminoalkylaminocarbonyl,
32 H2N-HC(Q5)-C(O)-O-, H2N-HC(Q5)-C(O)-N(H)-, (C1-C10) azidoalkyloxy, (C1-C10)
33 cyanoalkyloxy, P.G.-HN-HC(Q5)-C(O)-O-, (C1-C10) guanidinoalkyloxy, and (C1-C10)
34 guanidinoalkylcarboxy, where Q5 is a side chain of any amino acid, P.G. is an amino
35 protecting group, and

36 provided that at least two of R₁ through R₁₄ are independently selected from the group
37 consisting of a substituted or unsubstituted (C1-C10) aminoalkyloxy, (C1-C10)
38 alkylcarboxy-(C1-C10) alkyl, (C1-C10) alkylamino- (C1-C10) alkylamino, (C1-C10)
39 alkylamino- (C1-C10) alkylamino- (C1-C10) alkylamino, a substituted or unsubstituted (C1-
40 C10) aminoalkylcarboxy, a substituted or unsubstituted arylamino- (C1-C10) alkyl, a
41 substituted or unsubstituted (C1-C10) aminoalkyloxy -(C1-C10) alkyl, a substituted or
42 unsubstituted (C1-C10) aminoalkylaminocarbonyl, (C1-C10) quaternaryammonium
43 alkylcarboxy, H2N-HC(Q5)-C(O)-O-, H2N-HC(Q5)-C(O)-N(H)-, (C1-C10) azidoalkyloxy,
44 (C1-C10) cyanoalkyloxy, P.G.-HN-HC(Q5)-C(O)-O-, (C1-C10) guanidinoalkyloxy, and
45 (C1-C10) guanidinoalkylcarboxy; or a pharmaceutically acceptable salt thereof.

1 2. The compound of claim 1, wherein at least one of the following pairs is
2 deleted and the valency of the ring carbon atoms at these deleted positions is completed with
3 a double bond: R₅ and R₉; R₈ and R₁₀; and R₁₃ and R₁₄.

1 3. The compound of claim 1, wherein at least three of R₁ through R₁₄ are
2 independently selected from the group consisting of a substituted or unsubstituted (C1-C10)
3 aminoalkyloxy, (C1-C10) alkylcarboxy-(C1-C10) alkyl, a substituted or unsubstituted (C1-
4 C10) aminoalkylcarboxy, (C1-C10) alkylamino- (C1-C10) alkylamino, (C1-C10)
5 alkylamino- (C1-C10) alkylamino- (C1-C10) alkylamino, a substituted or unsubstituted (C1-
6 C10) aminoalkyl, a substituted or unsubstituted (C1-C10) aminoalkylaminocarbonyl, a
7 substituted or unsubstituted (C1-C10) aminoalkylcarboxamido, a substituted or unsubstituted
8 arylamino- (C1-C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkyloxy -(C1-
9 C10) alkyl, H2N-HC(Q5)-C(O)-O-, H2N-HC(Q5)-C(O)-N(H)-, (C1-C10) azidoalkyloxy,
10 (C1-C10) cyanoalkyloxy, (C1-C10) quaternaryammoniumalkylcarboxy, P.G.-HN-HC(Q5)-
11 C(O)-O-, (C1-C10) guanidinoalkyloxy, and (C1-C10) guanidinoalkylcarboxy.

1 4. The compound of claim 3, wherein the 3 of R₁ through R₁₄ independently
2 selected from the group consisting of a substituted or unsubstituted (C1-C10) alkylcarboxy-
3 (C1-C10) alkyl, (C1-C10) alkylamino-(C1-C10) alkyl, (C1-C10) alkylamino- (C1-C10)

4 alkylamino, (C1-C10) alkylamino- (C1-C10) alkylamino- (C1-C10) alkylamino, a substituted
5 or unsubstituted (C1-C10) aminoalkyl, a substituted or unsubstituted arylamino- (C1-C10)
6 alkyl, a substituted or unsubstituted (C1-C10) aminoalkyloxy -(C1-C10) alkyl, and (C1-C10)
7 quaternary ammonium alkylcarboxy.

1 5. The compound of claim 1, wherein the second steroid is a compound of
2 formula I.

1 6. The compound of claim 1, wherein the linking group is (C1-C10) alkyl-oxy-
2 (C1-C10) alkyl.

1 7. The compound of claim 1, wherein none of R₅, R₈, R₉, R₁₃, and R₁₄ is deleted.

1 8. The compound of claim 1, wherein each of R₃, R₇, and R₁₂ is independently
2 selected from the group consisting of a substituted or unsubstituted (C1-C10) aminoalkyloxy,
3 a substituted or unsubstituted (C1-C10) aminoalkylcarboxy, a substituted or unsubstituted
4 (C1-C10) aminoalkylaminocarbonyl, a substituted or unsubstituted (C1-C10)
5 aminoalkylcarboxamido, H₂N-HC(Q5)-C(O)-O-, H₂N-HC(Q5)-C(O)-N(H)-, (C1-C10)
6 azidoalkyloxy, (C1-C10) cyanoalkylcarboxy, P.G.-HN-HC(Q5)-C(O)-O-, (C1-C10)
7 guanidinoalkyloxy, and (C1-C10) guanidinoalkylcarboxy, where Q5 is a side chain of any
8 amino acid, P.G. is an amino protecting group or a pharmaceutically acceptable salt thereof.

1 9. The compound of claim 8, wherein R₁, R₂, R₄, R₅, R₆, R₈, R₁₀, R₁₁, R₁₃, R₁₄,
2 R₁₅, and R₁₆ are hydrogen.

1 10. The compound of claim 9, wherein R₁₇ is -CR₁₈R₁₉R₂₀, where each of R₁₈,
2 R₁₉, and R₂₀, is independently selected from the group consisting of hydrogen, hydroxyl, a
3 substituted or unsubstituted (C1-C10) alkyl, (C1-C10) hydroxyalkyl, (C1-C10) alkyloxy-(C1-
4 C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkyl, a substituted or unsubstituted
5 aryl, (C1-C10) haloalkyl, (C2-C6) alkenyl, (C2-C6) alkynyl, oxo, and a linking group
6 attached to a second steroid.

1 11. The compound of claim 8, wherein each of R₃, R₇, and R₁₂, is independently
2 selected from the group consisting of -O-(CH₂)_n-NH₂, -O-CO-(CH₂)_n-NH₂, -O-(CH₂)_n-
3 NH-C(NH)-NH₂, -O-(CH₂)_n-N₃, -O-(CH₂)_n-CN, where n is 1 to 3, and -O-C(O)-HC(Q5)-
4 NH₂, where Q5 is a side chain of any amino acid.

1 12. The compound of claim 8, wherein each of R₃, R₇, and R₁₂, is -O-CO-(CH₂)_n-
2 NH₂, where n is 1 to 4.

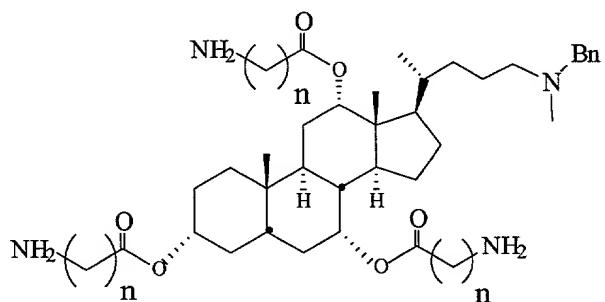
1 13. The compound of claim 12, wherein R₁₇ is -CH(CH₃)(CH₂)₃-O-(CH₂)_n-NH₂,
2 wherein n is 1-7.

1 14. The compound of claim 12, wherein R17 is -CH(CH₃)-(CH₂)_n-NR¹R², wherein n
2 is 0-2, R¹ and R² are independently (C1-C6) alkyl, aryl or aralkyl.

1 15. The compound of claim 1, wherein R17 is -CH(CH₃)(CH₂)_{n1}-CO-OR³, where R³
2 is selected from -(CH₂)_{n2}N⁺(CH₃)₃, wherein n1 and n2 are independently 1-4.

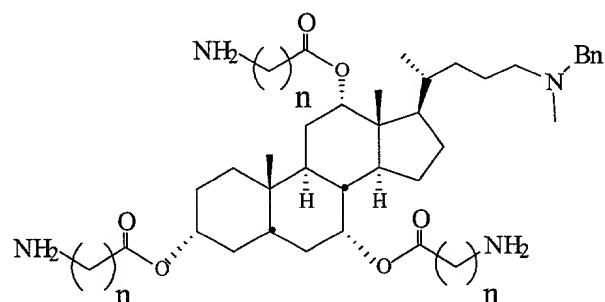
1 16. The compound of claim 15, wherein R3, R7, and R12 are -O-C(O)-(CH₂)_n-NH₂,
2 wherein n is 1-5.

1 17. The compound of claim 1 having the following formula:
2



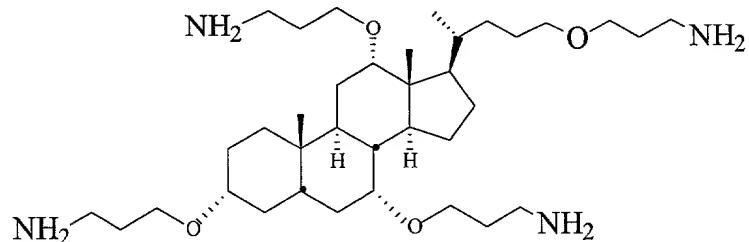
3 5 wherein n is 1-3, and Bn is a benzyl group.

1 18. The compound of claim 1 having the following formula:
2



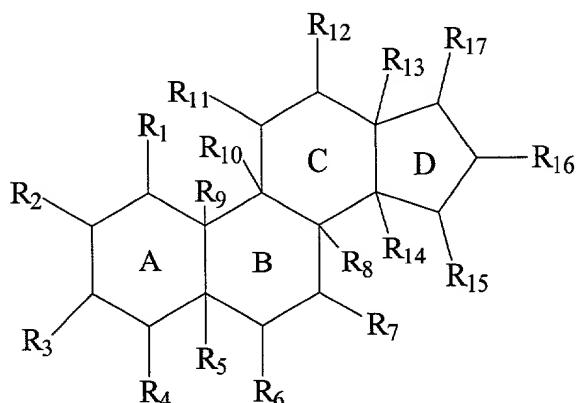
3 5 wherein n is 1-3, and R is selected from *n*-octyl, and trimethylethylammonio.

1 19. The compound of claim 1 having the formula:
2



4
5
6

1 20. A method of preparing the compound according to formula I
2



3
4 I
5
6

wherein fused rings A, B, C, and D are independently saturated or fully or partially unsaturated; and

R₁ through R₄, R₆, R₇, R₁₁, R₁₂, R₁₅, R₁₆, and R₁₇ is each independently selected from the group consisting of hydrogen, hydroxyl, a substituted or unsubstituted (C1-C10) alkyl, (C1-C10) hydroxyalkyl, (C1-C10) alkyloxy-(C1-C10) alkyl, (C1-C10) alkylcarboxy-(C1-C10) alkyl, (C1-C10) alkylamino-(C1-C10) alkyl, (C1-C10) alkylamino- (C1-C10) alkylamino, (C1-C10) alkylamino- (C1-C10) alkylamino- (C1-C10) alkylamino, a substituted or unsubstituted (C1-C10) aminoalkyl, a substituted or unsubstituted aryl, a substituted or unsubstituted arylamino- (C1-C10) alkyl, (C1-C10) haloalkyl, C2-C6 alkenyl, C2-C6 alkynyl, oxo, a linking group attached to a second steroid, a substituted or unsubstituted (C1-C10) aminoalkyloxy, a substituted or unsubstituted (C1-C10) aminoalkyloxy-(C1-C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkylcarboxy, a substituted or unsubstituted (C1-C10) aminoalkylaminocarbonyl, a substituted or unsubstituted (C1-C10) aminoalkylcarboxamido, H₂N-HC(Q5)-C(O)-O-, H₂N-HC(Q5)-C(O)-N(H)-, (C1-C10) azidoalkyloxy, (C1-C10) cyanoalkyloxy, P.G.-HN-HC(Q5)-C(O)-O-, (C1-C10) guanidinoalkyloxy, (C1-C10) quaternaryammoniumalkylcarboxy, and (C1-C10) guanidinoalkyl carboxy, where Q5 is a side chain of any amino acid, P.G. is an amino protecting group, and

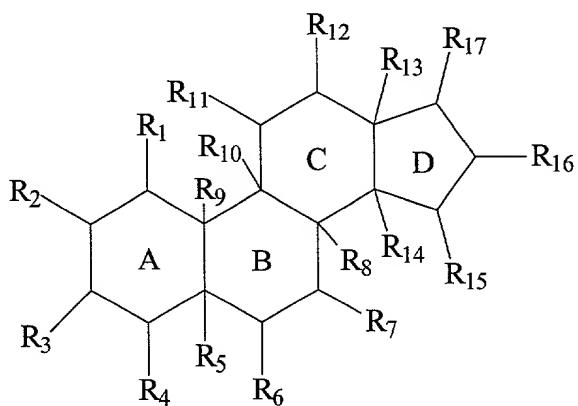
R₅, R₈, R₉, R₁₀, R₁₃, and R₁₄ is each independently:

deleted when one of fused rings A, B, C, or D is unsaturated so as to complete the valency of the carbon atom at that site, or

selected from the group consisting of hydrogen, hydroxyl, a substituted or unsubstituted (C1-C10) alkyl, (C1-C10) hydroxyalkyl, (C1-C10) alkyloxy-(C1-C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkyl, a substituted or unsubstituted aryl, C1-C10 haloalkyl, C2-C6 alkenyl, C2-C6 alkynyl, a linking group attached to a second steroid, a substituted or unsubstituted (C1-C10) aminoalkyloxy, a substituted or unsubstituted (C1-C10) aminoalkylcarboxy, a substituted or unsubstituted (C1-C10) aminoalkylaminocarbonyl, H2N-HC(Q5)-C(O)-O-, H2N-HC(Q5)-C(O)-N(H)-, (C1-C10) azidoalkyloxy, (C1-C10) cyanoalkyloxy, P.G.-HN-HC(Q5)-C(O)-O-, (C1-C10) guanidinoalkyloxy, and (C1-C10) guanidinoalkylcarboxy, where Q5 is a side chain of any amino acid, P.G. is an amino protecting group, and

provided that at least two of R₁ through R₁₄ are independently selected from the group consisting of a substituted or unsubstituted (C1-C10) aminoalkyloxy, (C1-C10) alkylcarboxy-(C1-C10) alkyl, (C1-C10) alkylamino- (C1-C10) alkylamino, (C1-C10) alkylamino- (C1-C10) alkylamino- (C1-C10) alkylamino, a substituted or unsubstituted (C1-C10) aminoalkylcarboxy, a substituted or unsubstituted arylamino- (C1-C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkyloxy-(C1-C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkylaminocarbonyl, (C1-C10) quaternaryammonium alkylcarboxy, H2N-HC(Q5)-C(O)-O-, H2N-HC(Q5)-C(O)-N(H)-, (C1-C10) azidoalkyloxy, (C1-C10) cyanoalkyloxy, P.G.-HN-HC(Q5)-C(O)-O-, (C1-C10) guanidinoalkyloxy, and (C1-C10) guanidinoalkylcarboxy; or a pharmaceutically acceptable salt thereof;

the method comprising contacting a compound of formula IV,



IV

where at least two of R₁ through R₁₄ are hydroxyl, and the remaining moieties on the fused rings A, B, C, and D are defined for formula I, with an electrophile to produce an alkyl ether compound of formula IV, wherein at least two of R₁ through R₁₄ are (C1-C10)alkyloxy;

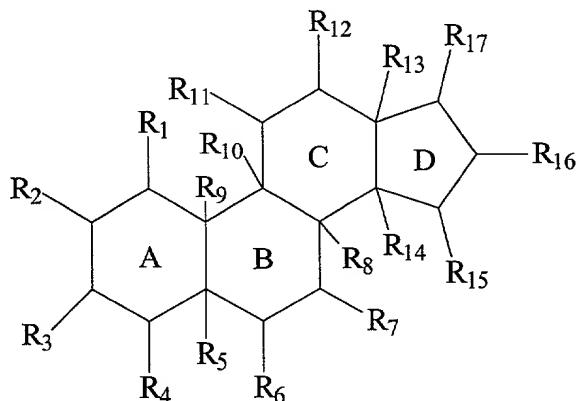
53 converting the alkyl ether compounds into an amino precursor compound wherein at
54 least two of R₁ through R₁₄ are independently selected from the group consisting of (C1-C10)
55 azidoalkyloxy and (C1-C10) cyanoalkyloxy; and

56 reducing the amino precursor compound to form a compound of formula I.

1 21. The method of claim 20, wherein the electrophile is allylbromide.

1 22. A method of producing a compound of formula I:

2 I



3 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 wherein fused rings A, B, C, and D are independently saturated or fully or partially
 unsaturated; and R₁ through R₄, R₆, R₇, R₁₁, R₁₂, R₁₅, R₁₆, and R₁₇ is each independently
 selected from the group consisting of hydrogen, hydroxyl, a substituted or unsubstituted (C1-
 C10) alkyl, (C1-C10) hydroxyalkyl, (C1-C10) alkyloxy-(C1-C10) alkyl, (C1-C10)
 alkylcarboxy-(C1-C10) alkyl, (C1-C10) alkylamino-(C1-C10) alkyl, (C1-C10) alkylamino-
 (C1-C10) alkylamino, (C1-C10) alkylamino- (C1-C10) alkylamino- (C1-C10) alkylamino, a
 substituted or unsubstituted (C1-C10) aminoalkyl, a substituted or unsubstituted aryl, a
 substituted or unsubstituted arylamino- (C1-C10) alkyl, (C1-C10) haloalkyl, C2-C6 alkenyl,
 C2-C6 alkynyl, oxo, a linking group attached to a second steroid, a substituted or
 unsubstituted (C1-C10) aminoalkyloxy, a substituted or unsubstituted (C1-C10)
 aminoalkyloxy-(C1-C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkylcarboxy,
 a substituted or unsubstituted (C1-C10) aminoalkylaminocarbonyl, a substituted or
 unsubstituted (C1-C10) aminoalkylcarboxamido, H2N-HC(Q5)-C(O)-O-, H2N-HC(Q5)-
 C(O)-N(H)-, (C1-C10) azidoalkyloxy, (C1-C10) cyanoalkyloxy, P.G.-HN-HC(Q5)-C(O)-O-,
 (C1-C10) guanidinoalkyl oxy, (C1-C10) quaternaryammoniumalkylcarboxy, and (C1-C10)
 guanidinoalkyl carboxy, where Q5 is a side chain of any amino acid, P.G. is an amino
 protecting group, and

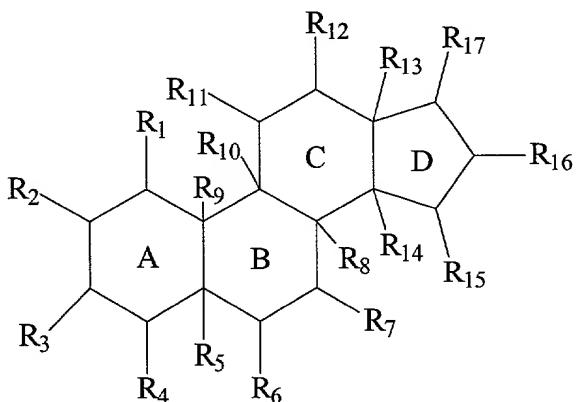
 R₅, R₈, R₉, R₁₀, R₁₃, and R₁₄ is each independently:

23 deleted when one of fused rings A, B, C, or D is unsaturated so as to complete the
24 valency of the carbon atom at that site, or

25 selected from the group consisting of hydrogen, hydroxyl, a substituted or
26 unsubstituted (C1-C10) alkyl, (C1-C10) hydroxyalkyl, (C1-C10) alkyloxy-(C1-C10) alkyl, a
27 substituted or unsubstituted (C1-C10) aminoalkyl, a substituted or unsubstituted aryl, C1-C10
28 haloalkyl, C2-C6 alkenyl, C2-C6 alkynyl, a linking group attached to a second steroid, a
29 substituted or unsubstituted (C1-C10) aminoalkyloxy, a substituted or unsubstituted (C1-
30 C10) aminoalkylcarboxy, a substituted or unsubstituted (C1-C10) aminoalkylaminocarbonyl,
31 H2N-HC(Q5)-C(O)-O-, H2N-HC(Q5)-C(O)-N(H)-, (C1-C10) azidoalkyloxy, (C1-C10)
32 cyanoalkyloxy, P.G.-HN-HC(Q5)-C(O)-O-, (C1-C10) guanidinoalkyloxy, and (C1-C10)
33 guanidinoalkylcarboxy, where Q5 is a side chain of any amino acid, P.G. is an amino
34 protecting group, and

35 provided that at least two of R₁ through R₁₄ are independently selected from the group
36 consisting of a substituted or unsubstituted (C1-C10) aminoalkyloxy, (C1-C10)
37 alkylcarboxy-(C1-C10) alkyl, (C1-C10) alkylamino- (C1-C10) alkylamino, (C1-C10)
38 alkylamino- (C1-C10) alkylamino- (C1-C10) alkylamino, a substituted or unsubstituted (C1-
39 C10) aminoalkylcarboxy, a substituted or unsubstituted arylamino- (C1-C10) alkyl, a
40 substituted or unsubstituted (C1-C10) aminoalkyloxy -(C1-C10) alkyl, a substituted or
41 unsubstituted (C1-C10) aminoalkylaminocarbonyl, (C1-C10) quaternaryammonium
42 alkylcarboxy, H2N-HC(Q5)-C(O)-O-, H2N-HC(Q5)-C(O)-N(H)-, (C1-C10) azidoalkyloxy,
43 (C1-C10) cyanoalkyloxy, P.G.-HN-HC(Q5)-C(O)-O-, (C1-C10) guanidinoalkyloxy, and
44 (C1-C10) guanidinoalkylcarboxy; or a pharmaceutically acceptable salt thereof;

45 the method comprising contacting a compound of formula IV,
46



47 IV

48 where at least two of R₁ through R₁₄ are hydroxyl, and the remaining moieties on the
49 fused rings A, B, C, and D are defined for formula I, with an electrophile to produce an alkyl

51 ether compound of formula IV, wherein at least two of R₁ through R₁₄ are (C1-C10)
52 alkyloxy;

53 converting the alkyl ether compound into an amino precursor compound wherein at
54 least two of R₁ through R₁₄ are independently selected from the group consisting of (C1-C10)
55 azidoalkyloxy and (C1-C10) cyanoalkyloxy;

56 reducing the amino precursor compound to produce an aminoalkyl ether compound
57 wherein at least two of R₁ through R₁₄ are (C1-C10) aminoalkyloxy; and

58 contacting the aminoalkyl ether compound with a guanidino producing electrophile to
59 form a compound of formula I.

1 23. The method of claim 22, wherein the guanidino producing electrophile is HSO₃-
2 C(NH)-NH₂.

1 24. A pharmaceutical composition comprising an effective amount of a
2 compound of claim 1.

1 25. The pharmaceutical composition of claim 24, wherein the composition
2 includes additional antibiotics.

1 26. A method of treating a microbial infection of a host by administering to the
2 host an effective amount of an anti-microbial composition comprising a compound according
3 to claim 1.

1 27. The method of claim 26 wherein the host is a human.

1 28. The method of claim 26 wherein the anti-microbial composition further
2 comprises a second anti-microbial substance to be delivered into a microbial cell.

1 29. The method of claim 28 wherein the second anti-microbial substance is an
2 anti-biotic.

1 30. The method of claim 26 wherein the infection is a bacterial infection.

1 31. The method of claim 30 wherein the infection is a infection a Gram-negative
2 bacterial infection.

1 32. The method of claim 30 wherein the bacterial infection is an infection with a
2 bacterium characterized by an outer membrane comprising a substantial percentage of lipid
3 A.

1 33. A method of enhancing cell permeability by administering to the cell a
2 permeability-enhancing amount of the compound of claim 1.

1 34. The method of claim 33 further comprising administering to the cell a
2 substance to be introduced into the cell.

1 35. The method of claim 34 in which the cell is a bacterium.

1 36. The method of claim 35 in which the bacterium is a Gram-negative bacterium.

1 37. The method of claim 34 in which the cell is a sperm cell and the compound is
2 part of a spermicidal composition.

1 38. A method of identifying compounds effective against a microbe comprising
2 administering a candidate compound and a compound according to claim 1 to the microbe
3 and determining whether the candidate compound has a static or toxic effect on the microbe.

1 39. The method of claim 38 in which the microbe is a Gram-negative bacterium.

1 40. A method of microbial growth control comprising contacting a microbe with
2 an effective amount of anti-microbial composition comprising a compound according to
3 claim 1.

1 41. A composition of matter comprising the compound of claim 1 in combination
2 with an anti-microbial substance to be introduced into a cell.

1 42. A compound comprising a ring system of at least 4 fused rings, each of the
2 rings having from 5-7 atoms, the ring system having two faces, wherein the compound
3 comprises 3 chains attached to the same face of the ring system, each of the chains
4 containing a multiple nitrogen-containing group, wherein the multiple nitrogen-containing
5 group is separated from the ring system by at least one atom, and wherein the multiple
6 nitrogen-containing group is a (C1-C10) alkylamino (C1-C1) alkyamino group or a (C1-C10)
7 alkylamino (C1-C1) alkyamino (C1-C1) alkyamino group.

1 43. The compound of claim 42, wherein each of the multiple nitrogen-containing
2 groups is separated from the steroid backbone by at least two atoms.

1 44. The compound of claim 43, wherein each of the multiple nitrogen-containing
2 groups is separated from the steroid backbone by at least three atoms.

1 45. The compound of claim 44, wherein each of the multiple nitrogen-containing
2 groups is separated from the steroid backbone by at least four atoms.

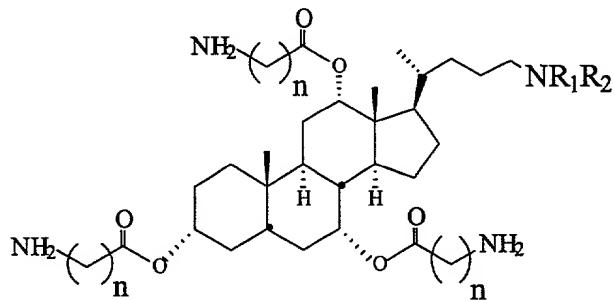
1 46. The compound of claim 42, wherein the compound further comprises a
2 hydrophobic group attached to the steroid backbone.

1 47. The compound of claim 42, wherein the hydrophobic group is selected from
2 the group consisting of a substituted (C3-10) aminoalkyl group, a (C1-10) alkyloxy (C3-10)
3 alkyl group, and a (C1-10) alkylamino (C3-10)alkyl group.

1 48. A pharmaceutical composition comprising an effective amount of a
2 compound of claim 42.

1 49. A method of enhancing cell permeability by administering to the cell a
2 permeability enhancing amount of the compound of claim 42.

1 50. A compound of claim 1 having the formula:

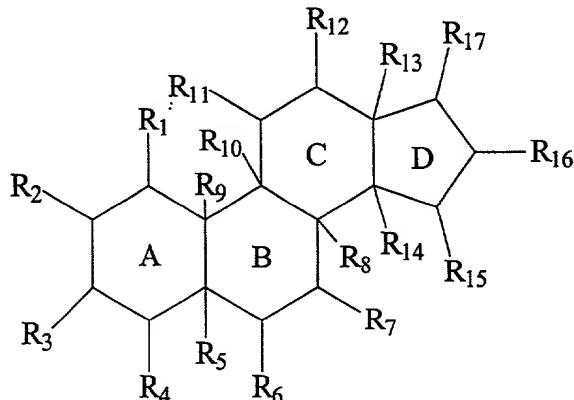


3 wherein R₁ is selected from hydrogen, or (C1-C10) alkylamino, R₂ is selected from
4 (C1-C10) alkylamino or (C1-C10) alkylamino-(C1-C10) alkylamino, and n is 1-3.

1 51. The compound of claim 1, wherein R₁ is hydrogen and R₂ is (C1-C10)
2 alkylamino-(C1-C10) alkylamino.

1 52. The compound of claim 1, wherein R₁ is (C1-C10) alkylamino, and R₂ is (C1-
2 C10) alkylamino.

3 53. A compound according to formula I



I

3 wherein:

5 fused rings A, B, C, and D are independently saturated or fully or partially
6 unsaturated; and

7 R₁ through R₄, R₆, R₇, R₁₁, R₁₂, R₁₅, and R₁₆, is each independently selected from the
8 group consisting of hydrogen, hydroxyl, a substituted or unsubstituted (C1-C10) alkyl, (C1-
9 C10) hydroxyalkyl, (C1-C10) alkyloxy-(C1-C10) alkyl, (C1-C10) alkylcarboxy-(C1-C10)
10 alkyl, (C1-C10) alkylamino-(C1-C10) alkyl, (C1-C10) alkylamino- (C1-C10) alkylamino,
11 (C1-C10) alkylamino- (C1-C10) alkylamino- (C1-C10) alkylamino, a substituted or
12 unsubstituted (C1-C10) aminoalkyl, a substituted or unsubstituted aryl, a substituted or
13 unsubstituted arylamino- (C1-C10) alkyl, (C1-C10) haloalkyl, C₂-C₆ alkenyl, C₂-C₆
14 alkynyl, oxo, a linking group attached to a second steroid, a substituted or unsubstituted (C1-
15 C10) aminoalkyloxy, a substituted or unsubstituted (C1-C10) aminoalkyloxy -(C1-C10)
16 alkyl, a substituted or unsubstituted (C1-C10) aminoalkylcarboxy, a substituted or
17 unsubstituted (C1-C10) aminoalkylaminocarbonyl, a substituted or unsubstituted (C1-C10)
18 aminoalkylcarboxamido, H₂N-HC(Q5)-C(O)-O-, H₂N-HC(Q5)-C(O)-N(H)-, (C1-C10)
19 azidoalkyloxy, (C1-C10) cyanoalkyloxy, P.G.-HN-HC(Q5)-C(O)-O-, (C1-C10)
20 guanidinoalkyl oxy, (C1-C10) quaternaryammoniumalkylcarboxy, and (C1-C10)
21 guanidinoalkyl carboxy, where Q5 is a side chain of any amino acid, P.G. is an amino
22 protecting group, and

23 R₅, R₈, R₉, R₁₀, R₁₃, and R₁₄ is each independently:

24 deleted when one of fused rings A, B, C, or D is unsaturated so as to complete the
25 valency of the carbon atom at that site, or

26 selected from the group consisting of hydrogen, hydroxyl, a substituted or
27 unsubstituted (C1-C10) alkyl, (C1-C10) hydroxyalkyl, (C1-C10) alkyloxy-(C1-C10) alkyl, a
28 substituted or unsubstituted (C1-C10) aminoalkyl, a substituted or unsubstituted aryl, C₁-C₁₀
29 haloalkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, a linking group attached to a second steroid, a
30 substituted or unsubstituted (C1-C10) aminoalkyloxy, a substituted or unsubstituted (C1-
31 C10) aminoalkylcarboxy, a substituted or unsubstituted (C1-C10) aminoalkylaminocarbonyl,
32 H₂N-HC(Q5)-C(O)-O-, H₂N-HC(Q5)-C(O)-N(H)-, (C1-C10) azidoalkyloxy, (C1-C10)
33 cyanoalkyloxy, P.G.-HN-HC(Q5)-C(O)-O-, (C1-C10) guanidinoalkyloxy, and (C1-C10)
34 guanidinoalkylcarboxy, where Q5 is a side chain of any amino acid, P.G. is an amino
35 protecting group, and

36 R₁₇ is selected from the group consisting of substituted or unsubstituted
37 alkylcarboxyalkyl and protected or unprotected poly(aminoalkyl),

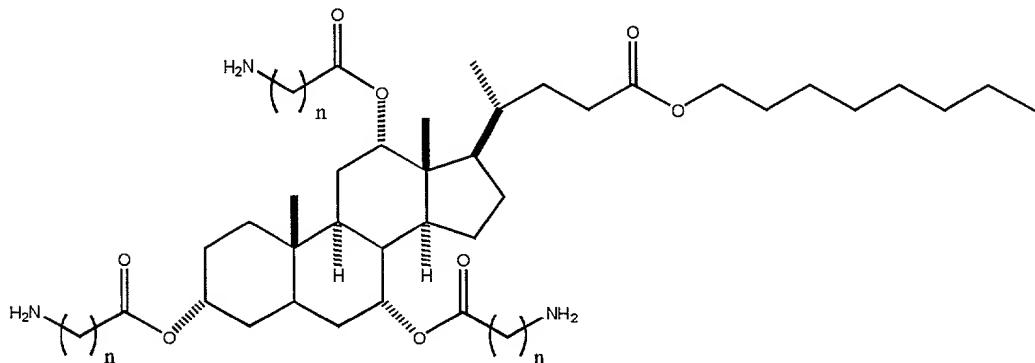
38 provided that at least two of R₁ through R₁₄ are independently selected from the group
39 consisting of a substituted or unsubstituted (C1-C10) aminoalkyloxy, (C1-C10)
40 alkylcarboxy-(C1-C10) alkyl, (C1-C10) alkylamino- (C1-C10) alkylamino, (C1-C10)

41 alkylamino- (C1-C10) alkylamino- (C1-C10) alkylamino, a substituted or unsubstituted (C1-
42 C10) aminoalkylcarboxy, a substituted or unsubstituted arylamino- (C1-C10) alkyl, a
43 substituted or unsubstituted (C1-C10) aminoalkyloxy -(C1-C10) alkyl, a substituted or
44 unsubstituted (C1-C10) aminoalkylaminocarbonyl, (C1-C10) quaternaryammonium
45 alkylcarboxy, H2N-HC(Q5)-C(O)-O-, H2N-HC(Q5)-C(O)-N(H)-, (C1-C10) azidoalkyloxy,
46 (C1-C10) cyanoalkyloxy, P.G.-HN-HC(Q5)-C(O)-O-, (C1-C10) guanidinoalkyloxy, and
47 (C1-C10) guanidinoalkylcarboxy; or a pharmaceutically acceptable salt thereof.

1

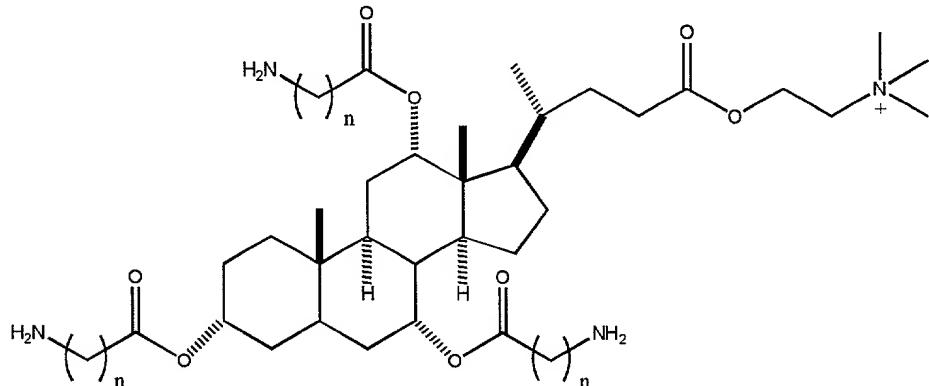
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54. The compound of claim 53, wherein the compound has the formula:



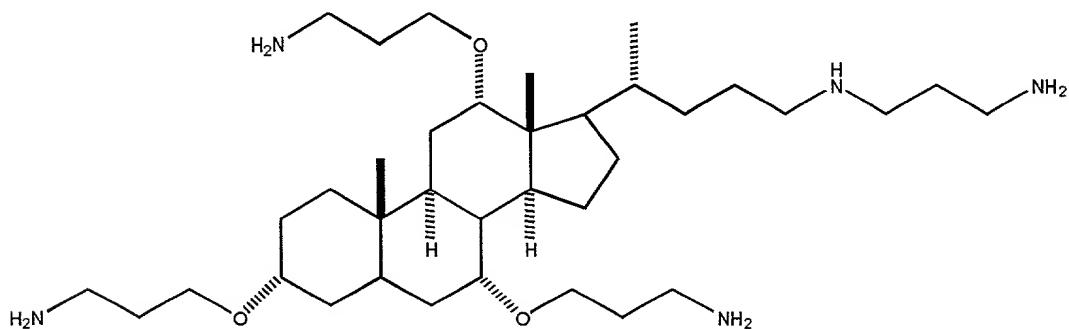
wherein n is 1-3.

55. The compound of claim 53, wherein the compound has the formula:

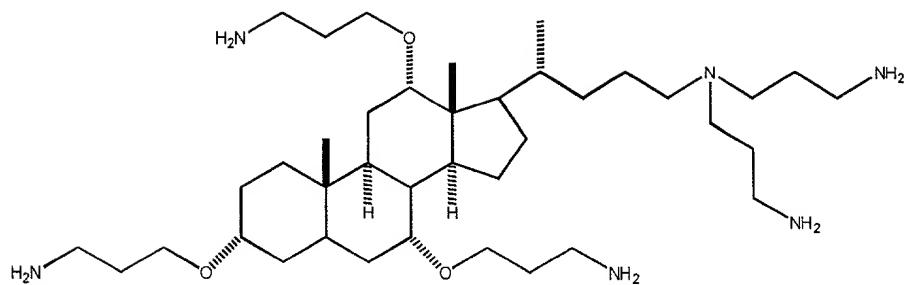


wherein n is 1-3.

56. The compound of claim 53, wherein the compound has the formula:



57. The compound of claim 53, wherein the compound has the formula:



58. The compound of claim 53, wherein the compound has the formula:

